

Permabond[®]

Engineering Adhesives



"Our Science . . .

Your Success"

www.permabond.com

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ISO 9001:2008 Certified

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Permabond manufactures engineering adhesives and sealants for manufacturing, assembly, repair, and maintenance, and custom formulates for unique requirements.

Our team is dedicated to providing high quality products that meet today's challenges for improvements in performance, efficiency and cost effectiveness.

Contact Permabond for all of your bonding and sealing needs!



800-714-0170



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We welcome your call!



This brochure contains information on our most popular products. If you don't see exactly what you need or would like assistance in selecting the best product for your application please contact us.

Application Assistance - 800•640•7599

Adhesive Selection

The following tables and charts will help in selecting an adhesive for your application.

Highlights & Limitations by Chemistry

	Anaerobics	Cyanoacrylates	2-Part Acrylics	No-Mix Acrylics	1 Part Epoxies	2 Part Epoxies	UV Light Cured
Highlights	Lock, retain & seal, prevent loosening & corrosion	Rapid cure, bond a wide range of substrates	High strength, with good impact resistance	Flexible, fast fixture, with good impact resistance	Strong - no mix	Strong - room temperature cure	Rapid cure, good adhesion to plastics, glass & metals
Limitations	Metals only	Poor polar solvent resistance	Mix required	2 step application	Heat required	Mix required	Cure equipment required

Solvent Resistance by Chemistry

Chemistry	Polar Solvents	Non-Polar Solvents
UV	Good	Good
Tough Acrylic	Good	Very Good
Epoxy	Very Good	Very Good
Cyanoacrylate	Poor	Good
Anaerobic	Excellent	Excellent

Note:

Examples of polar solvents include:
Water, Ethylene Glycol, IPA, Acetone

Examples of non-polar solvents include:
Motor Oil, Toluene, Gasoline

Chemical Compatibility of Anaerobics

Liquids						Gases					
Acetic acid	B	Chromic acid	C	Glycerine	A	Oil (hydraulic)	A	Shellac	A	Air	A
Acetone	A	Citric acid	C	Gypsum	A	Oil (linseed)	A	Sodium Hydroxide	C	Carbon dioxide	A
Alcohols	A	Copper sulphate	A	Hexane	A	Oil (lubricating)	A	Starch	A	Carbon monoxide	A
Ammonia sol.	C	Creosote	A	Hydrochloric acid	C	Oil (mineral)	A	Sugar	A	Chlorine	X
Animal fat	A	Cyanide sol.	B	Ink	A	Ozone (wet)	X	Sulphuric acid	C	Freon	C
Battery acid	B	Detergents	A	Insecticide*	A	Paraffin	A	Sulphuric acid	C	Helium	A
Bleach	A	Dielectric fluid*	A	Isocyanate resin	A	Perfume	A	Toluene	A	Methane	A
Bromine	X	Dye stuffs	A	Jet fuel	A	Petrol	A	Trichloroethane	A	Natural gas	A
Carbolic acid	B	Ethyl acetate	A	Kerosene	A	Petroleum jelly	A	Turpentine	A	Pure oxygen	**
Carbonic acid	B	Ferric chloride	B	Lactic acid	A	Photo Developer	A	Water (fresh/sea)	A	Ozone	X
Cement	A	Fertilizer*	A	Nitric acid	X	Phosphoric acid	C	Water (heavy)	A	Propane	A
China Clay	A	Formaldehyde	C	Oil (fuel)	A	Sewage	A	Xylene	A	Steam	X

*Test first as some brands/types are more aggressive than others

** MH052 - Approved for use with gaseous oxygen up to 10 bar (145 psi) and 60°C (140°F)

Few industrial chemicals have a damaging effect on Permabond's anaerobic adhesives. However, strong concentrations or elevated temperature may make the adhesive more susceptible to chemical degradation.

A: Most Permabond products are suitable

B: For concentrations up to 10% most adhesives can be used

C: Only use high-strength Permabond products

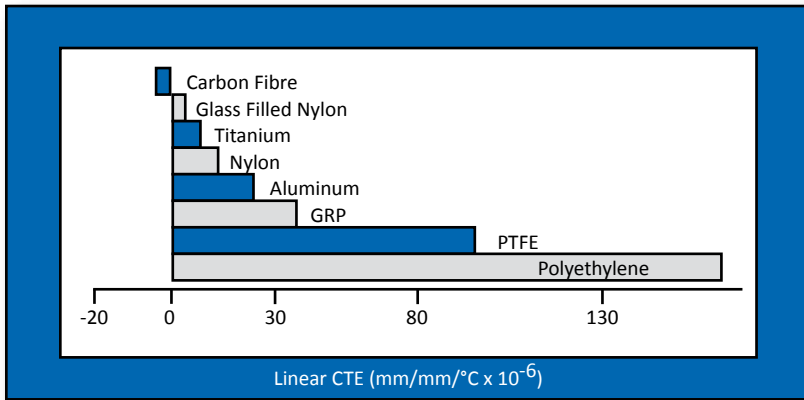
X: Not suitable for Permabond anaerobic adhesives

Adhesion by Chemistry

Substrate	Anaerobics	Cyanoacrylates	2-Part Acrylics	No-Mix Acrylics	1 Part Epoxies	2 Part Epoxies	UV Light Cured
Metal	Excellent	Very Good	Excellent	Excellent	Excellent	Excellent	Good
Plastic	N/A	Excellent	Very Good	*Good	N/A	Good	Very Good
Glass	N/A	Poor	Good	Excellent	Excellent	Excellent	Excellent
Rubber	N/A	Very Good	Poor	Poor	Fair	Poor	Poor
Wood	N/A	Good	Good	Good	Very Good	Very Good	Poor

*TA4246 is excellent

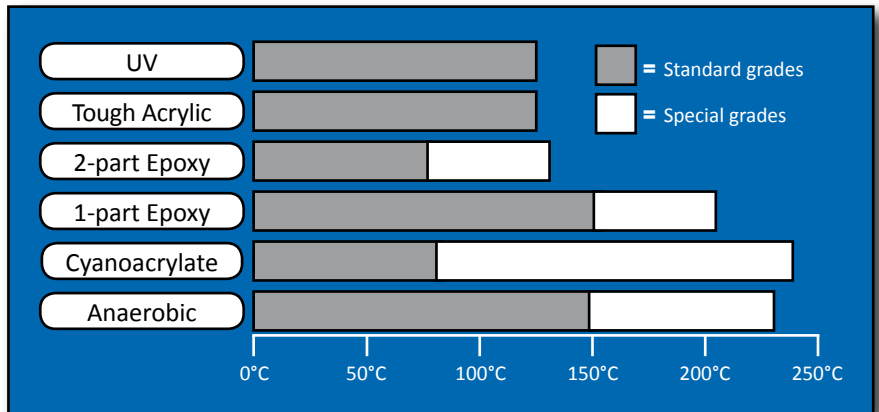
Coefficient of Thermal Expansion



TIP: When bonding dissimilar materials in an environment subject to temperature change, slightly flexible, toughened adhesives outperform mechanical fasteners. Flexible adhesives disperse the stress caused by differential thermal expansion and also absorb some of the stress.

Note: Products can withstand higher temperatures for brief periods providing the joint is not unduly stressed.

Temperature Resistance by Chemistry



Strength & Flexibility by Chemistry

	Shear Strength	Peel Strength	Tensile Strength	Flexibility	Hardness
Anaerobics	High	Low	High	Low	Rigid
Cyanoacrylates	High	Low	High	Low	Rigid
2-Part Acrylics	High	Medium	High	Medium	Semi-Rigid
No-Mix Acrylics	High	Medium	High	Medium	Semi-Rigid
1 Part Epoxies	Very high	Medium	High	Low	Rigid
2 Part Epoxies	High	Medium	High	Medium	Semi-Rigid
UV Light Cured	High	Medium	High	Medium	Semi-Rigid

Anaerobic Adhesives & Sealants

Permabond threadlocking anaerobic adhesives and sealants enable you to lock screws, nuts, bolts, and studs against loosening.

- Stops nuts and bolts from working loose due to vibration
- Varying strengths to meet removable & permanent requirements
- More cost-effective than mechanical locking devices
- Lubricates for easier assembly and prevents rust
- Seals against leaks
- Prevents loosening due to thermal expansion

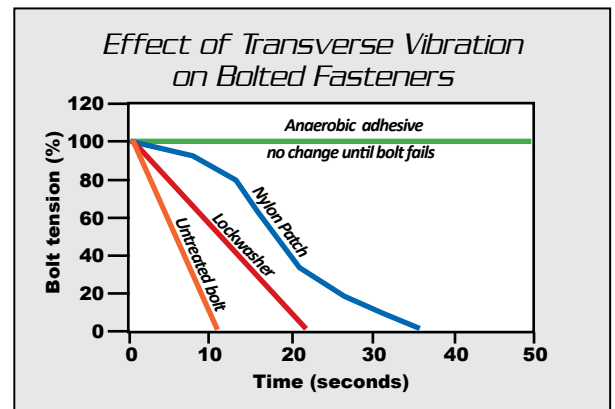
Anaerobic Threadlockers

	REMOVABLE				PERMANENT				
Grade	LM113	MM115	MM115 Pure	HM118	HL126	HH120	HM128	HM129	HH131
Feature	Low Strength	General Purpose	NSF/ANSI 61 Certified	High Strength Removable	Wicking & Weld sealing	Gap Filling	General Purpose	High Strength	High Temperature
Color	Purple	Blue	Colorless	Red	Green	Red	Red	Red	Red
Viscosity	1,200 cP	1,300 cP		1,800 cP	12 cP	7,000 cP	500 cP	500 cP	10,000 cP
Max Gap Fill	0.006 in	0.006 in		0.008 in	0.005 in	0.01 in	0.006 in	0.006 in	0.012 in
	0.152 mm	0.152 mm		0.203 mm	0.127 mm	0.254 mm	0.152 mm	0.152 mm	0.305 mm
*Shear Strength	750 psi	1,500 psi		2,500 psi	1,500 psi	2,500 psi	2,500 psi	2,500 psi	2,500 psi
	5 N/mm ²	10 N/mm ²		17 N/mm ²	10 N/mm ²	17 N/mm ²	17 N/mm ²	17 N/mm ²	17 N/mm ²
**Torque Breakaway	80 in•lb	140 in•lb		200 in•lb	125 in•lb	275 in•lb	275 in•lb	280 in•lb	240 in•lb
	9 N•m	16 N•m		23 N•m	14 N•m	31 N•m	31 N•m	32 N•m	27 N•m
**Torque Prevail	40 in•lb	60 in•lb		280 in•lb	300 in•lb	300 in•lb	350 in•lb	500 in•lb	480 in•lb
	5 N•m	7 N•m		32 N•m	34 N•m	34 N•m	40 N•m	56 N•m	54 N•m
*Fixture	15 mins	10 mins		10 mins	8 mins	10 mins	15 mins	10 mins	15 mins
Temp. Range	-65 to 300°F	-65 to 300°F		-65 to 300°F	-65 to 300°F	-65 to 300°F	-65 to 300 °F	-65 to 300°F	-65 to 445°F
	-54 to 150°C	-54 to 150°C		-54 to 150°C	-54 to 150°C	-54 to 150°C	-54 to 150°C	-54 to 150°C	-54 to 230°C

*Steel **M10 Steel nuts and bolts

Super Active (Very fast cure)	Active (Fast cure)	Inactive (Slow cure)	Passive (Activator required)
Brass Copper Magnesium	Steel Nickel Iron Aluminum Zinc	Anodized aluminum Cadmium finishes Chrome finishes Passivated metals Stainless steel Titanium	Ceramics Glass Plastics Painted finishes Lacquered finishes

Anaerobic adhesives cure in the absence of oxygen and the presence of metal. The cure speed is affected by the degree of 'activity' of the metal (see chart above) as well as the gap the adhesive must cure through and the temperature.





PermaBond anaerobic thread sealants are designed to replace traditional thread sealing materials such as hemp, PTFE tape, and pipe dope.

- No loose particles to clog valves
- Will not shred, creep, or relax over time
- Easy to apply, allows accurate positioning of pipes & fittings
- Lubricates for easier assembly
- Fully cured sealants typically seal to the burst pressure of the pipe
- Grades available suitable for water, gas, air, & hydraulic systems
- Resistant to a wide variety of chemicals

Anaerobic Thread Sealants

Grade	LM012	LH050	LH050 Pure	LH051	LH056	MH052	LH150
Feature	No Fillers, Hydraulics Sealing Grade	General Purpose UL Listed	NSF/ANSI 61 Certified, Potable Water Grade	Automatic Dispensing	Fire Protection Grade	Medium Strength BAM Approved for Oxygen	Stainless Steel Grade
Color	Brown	White		White	White	Yellow	White
Viscosity	2,000 cP	250,000 cP		200,000 cP	250,000 cP	50,000 cP	260,000 cP
Max Gap Fill	0.008 in	0.020 in		0.020 in	0.020 in	0.020 in	0.020 in
	0.203 mm	0.508 mm		0.508 mm	0.508 mm	0.508 mm	0.508 mm
*Shear Strength	750 psi	1,000 psi		1,000 psi	1,000 psi	1,400 psi	1,000 psi
	5 N/mm ²	7 N/mm ²		7 N/mm ²	7 N/mm ²	10 N/mm ²	7 N/mm ²
**Torque Breakaway	25 in•lb	35 in•lb		35 in•lb	35 in•lb	180 in•lb	35 in•lb
	3 N•m	4 N•m		4 N•m	4 N•m	20 N•m	4 N•m
**Torque Prevail	15 in•lb	25 in•lb		25 in•lb	25 in•lb	100 in•lb	25 in•lb
	2 N•m	3 N•m		3 N•m	3 N•m	11 N•m	3 N•m
*Fixture	30 mins	120 mins		120 mins	120 mins	15 mins	120 mins
Temp. Range	-65 to 350°F	-65 to 350°F		-65 to 350°F	-65 to 350°F	-65 to 300°F	-65 to 350°F
	-54 to 177°C	-54 to 177°C		-54 to 177°C	-54 to 177°C	-54 to 150°C	-54 to 177°C

*Steel

**M10 Steel nuts and bolts

Assembly & Removal

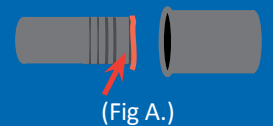
- Parallel to parallel pipe joints (Fig A.) Apply sealant to the leading edge of the male component.
- Taper to parallel pipe joints (Fig B.) Apply sealant several threads back from the leading edge of the male component to ensure maximum contact.

*** IN EACH CASE EXCESS SEALANT SHOULD BE VISIBLE AFTER TIGHTENING**

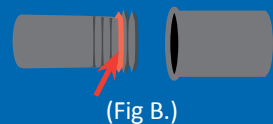
Pipe joints sealed with low-strength thread sealants can be dismantled using normal tools.

Heating parts with a hot air gun or blow torch will make parts easier to disassemble.

Before reapplying sealant, clean pipe joints with a wire brush.



(Fig A.)



(Fig B.)

Anaerobic Adhesives & Sealants

Permabond gasketing anaerobic adhesives replace traditional cork, wood, rubber, paper and silicone gaskets.

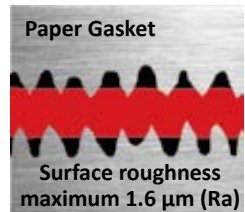
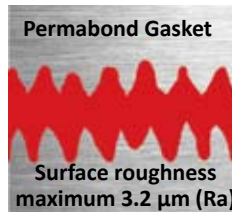
- No relaxation or shrinkage eliminates need to retighten over time
- One adhesive will replace many pre-cut gasket shapes
- No need to handle fragile gaskets
- No disintegration means no leaks or blockages
- Vibration proof
- No long-term embrittlement
- Easy to dismantle with normal tools
- Seals rough surfaces; reduce machining needs
- Non-shimming
- 100% surface contact for uniform stress distribution

Anaerobic Form-in-Place Gasketing

Grade	HH190	MH196	LH197	MH199
Feature	General purpose flange sealant	Fast curing, high temperature resistant	Flexible, easy to remove even from soft metals	Highly thixotropic, high temperature resistant
Color	Purple	Red	Green	Red
Viscosity	300,000 cP	150,000 cP	37,000 cP	185,000 cP
Max Gap Fill	0.025 in	0.020 in	0.012 in	0.020 in
	0.635 mm	0.508 mm	0.305 mm	0.508 mm
*Shear Strength	900 psi	1,500 psi	750 psi	1,100 psi
	6 N/mm ²	10 N/mm ²	5 N/mm ²	8 N/mm ²
*Fixture	15 mins	15 mins	20 mins	20 mins
Temp. Range	-65 to 250°F	-65 to 390°F	-65 to 300°F	-65 to 390°F
	-54 to 120°C	-54 to 200°C	-54 to 150°C	-54 to 200°C

*Steel

TIP: Liquid gasketing adhesives give 100% contact between metal parts and also allow the engineer to cut down the amount of surface-finish machining, therefore reducing costs and increasing production rates.



50ml of adhesive will go how far?	
Bead Diameter	Length of Bead
1.5mm ●	25m
3mm ●	6m

Use Permabond ASC10 Anaerobic Surface Conditioner to speed-up anaerobic adhesive cure and to activate inactive surfaces.



Retaining compounds are for the permanent bonding of co-axial joints.

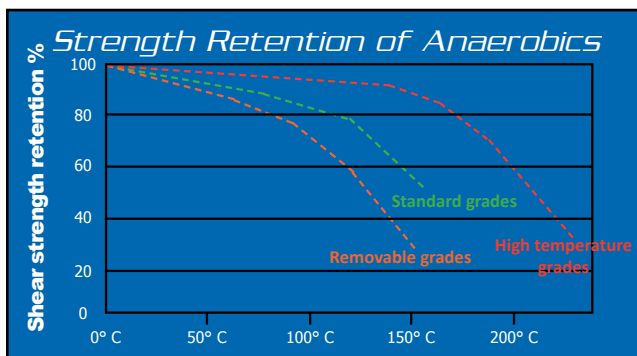
- Augments slip fits
- Prevents corrosion
- Mounts bearings
- Restores correct fit
- Reduces machining time due to relaxed tolerances
- Rapid, quick and easy assembly of parts
- 100% surface-to-surface contact
- Allows for greater load carrying capacity

Anaerobic Retaining Compounds

Grade	HH040	HH040 PURE	HL138	HM160	HM161	HM162	HM165	HH167
Feature	General purpose, maximum gap fill	General purpose, NSF/ANSI 61 Certified	General purpose, press fit	General purpose, slip fit	Gap fill, slip fit	Fast curing, high temperature resistant	Maximum gap fill, high temperature resistant	Maximum gap fill, metal repair
Color	Green	Colorless	Green	Green	Green	Green	Green	Silver
Viscosity	5,000 cP		150 cP	600 cP	2,000 cP	1000 cP	10,000 cP	500,000
Max Gap Fill	0.010 in		0.005 in	0.008 in	0.010 in	0.008 in	0.012 in	0.012
	0.254 mm		0.127 mm	0.203 mm	0.254 mm	0.203 mm	0.305 mm	0.305 mm
*Shear Strength	2,000 psi		2,300 psi	3,000 psi	3,500 psi	4,300 psi	3,800 psi	4,700 psi
	14 N/mm ²		16 N/mm ²	21 N/mm ²	24 N/mm ²	30 N/mm ²	26 N/mm ²	32 N/mm ²
**Torque Breakaway	200 in•lb		180 in•lb	250 in•lb	275 in•lb	280 in•lb	250 in•lb	280 in•lb
	23 N•m		20 N•m	28 N•m	31 N•m	32 N•m	28 N•m	32 N•m
**Torque Prevail	300 in•lb		320 in•lb	400 in•lb	400 in•lb	550 in•lb	480 in•lb	400 in•lb
	34 N•m		36 N•m	45 N•m	45 N•m	62 N•m	54 N•m	45 N•m
*Fixture	15 mins		10 mins	10 mins	10 mins	5 mins	15 mins	15 mins
Temp. Range	-65 to 300°F		-65 to 300°F	-65 to 350°F	-65 to 350°F	-65 to 390°F	-65 to 445°F	-65 to 300°F
	-54 to 150°C		-54 to 150°C	-54 to 177°C	-54 to 177°C	-54 to 200°C	-54 to 230°C	-54 to 150°C

*Steel

**M10 Steel nuts and bolts



Permabond's adhesives and sealants provide 100% surface-to-surface contact while mechanical joining techniques provide only 20% of surface-to-surface contact. The resulting surface area increase allows for a greater load carrying capacity, more than 5 times that of mechanical joining techniques.



Instant Adhesives

Cyanoacrylate adhesives are single component adhesives that cure by reacting to small traces of moisture on the surface of the substrates being bonded. They cure very quickly at room temperature, eliminating the need for costly ovens or curing equipment.

Applications include:

- Electronics wire tacking
- Bonding headsets
- Hose clips onto hoses
- Bonding automotive interior trim
- Tacking parts during assembly process
- Fabricate silicone & standard o-rings
- Disposable medical device bonding
- Bonding musical instrument components
- Mobile phone casings, antennae, & keypads
- Sealing batteries
- Glazing applications
- Sealing transformer laminates

The following set of general purpose ethyl cyanoacrylate adhesives quickly form bonds to a wide variety substrates. Strengths listed here are for grit blasted steel but these adhesives are known for their ability to very effectively bond plastics and other substrates.

<i>General Purpose</i>		Viscosity cP	Max. Gap Fill		*Shear Strength		*Set Time secs	Temperature Range	
Grade	Description		in.	mm	psi	N/mm ²		°F (°C)	°F (°C)
101	Wicking type, plastic bonding	2	0.002	0.051	3,000	21	5	-65 (-54)	180 (82)
102	Plastic bonding	80	0.006	0.152	3,000	21	10	-65 (-54)	180 (82)
105	Elastomer bonding	40	0.004	0.102	2,900	20	10	-65 (-54)	180 (82)
108	Intermediate gap fill, plastic bonding	500	0.008	0.203	3,000	21	10	-65 (-54)	180 (82)
240	Plastic bonding, maximum gap fill & flow control	2,000	0.017	0.432	3,300	23	15	-65 (-54)	180 (82)
268	Fast curing maximum gap fill	1,800	0.017	0.432	3,000	21	10	-65 (-54)	180 (82)
2010	Thixotropic gel, maximum gap fill	23,000	0.020	0.508	3,000	21	10	-65 (-54)	180 (82)

* Grit blasted steel

The original instant adhesive, 910, continues to be the only pure methyl cyanoacrylate. It is relied on to create the strongest bonds between metal substrates.

<i>Metal Bonding</i>		Viscosity cP	Max. Gap Fill		*Shear Strength		*Set Time secs	Temperature Range	
Grade	Description		in.	mm	psi	N/mm ²		°F (°C)	°F (°C)
170	Maximum gap fill	1,500	0.015	0.381	3,500	24	15	-65 (-54)	195 (90)
910	The Original! General purpose	80	0.006	0.152	3,700	26	10	-65 (-54)	195 (90)
910FS	Wicking type	3	0.002	0.051	3,700	26	5	-65 (-54)	195 (90)

* Grit blasted steel

Cyanoacrylates form bonds with strong shear and tensile properties. For increased impact resistance, PermaBond offers its impact resistant 730 series in both clear and black. Consider this series when the assembly is subject to vibration, impact, peel, or flexing stresses. In addition to the impact resistance, these ethyl cyanoacrylates have higher temperature resistance.

<i>Toughened</i>		Color	Viscosity cP	Max. Gap Fill		*Shear Strength		*Set Time secs	Temperature Range	
Grade	Description			in.	mm	psi	N/mm ²		°F (°C)	°F (°C)
731	Excellent peel, impact & shear strength	Clear	150	0.006	0.152	4,000	27	30	-65 (-54)	250 (120)
735	Excellent peel, impact & shear strength	Black	250	0.006	0.152	4,000	27	30	-65 (-54)	250 (120)
737	Impact resistant, gap fill	Black	3,000	0.020	0.508	3,000	21	15	-65 (-54)	250 (120)

* Grit blasted steel



PermaBond overcomes the challenges posed when bonding acidic surfaces such as wood, leather, paper, or cork with their range of surface insensitive products. These ethyl cyanoacrylates also perform well on very dry or porous materials, extending the range of application possibilities. The full product line includes wicking grades for post assembly application, gap filling to 0.508 mm and a true non-sag, no-drip gel for vertical applications.

<i>Surface Insensitive</i>		Viscosity cP	Max. Gap Fill		*Shear Strength		*Set Time secs	Temperature Range	
Grade	Description		in.	mm	psi	N/mm ²		°F (°C)	°F (°C)
790	Extremely fast curing, wicking type	2	0.002	0.051	2,900	20	3	-65 (-54)	180 (82)
791	Extremely fast curing, very close fitting parts	40	0.004	0.102	2,900	20	3	-65 (-54)	180 (82)
792	Extremely fast curing, close fitting parts	80	0.006	0.152	2,900	20	3	-65 (-54)	180 (82)
795	Extremely fast curing, general purpose	500	0.007	0.178	2,900	20	4	-65 (-54)	180 (82)
799	Fast curing, maximum gap fill	5,000	0.020	0.508	3,000	21	8	-65 (-54)	180 (82)
2011	Thixotropic gel, non-sag, maximum gap fill	Gel	0.020	0.508	3,200	22	10	-65 (-54)	180 (82)

* Grit blasted steel

Acidic surfaces and porous surfaces will yield reduced cure speeds and may require a surface insensitive cyanoacrylate and/or accelerator (see chart below). Cure is also affected by the gap the adhesive must cure through and the relative humidity.

Surface Type	Bond Method	Example Materials	Example Products
Neutral	Use Instant Adhesive	Most Plastics & Metals	102; 910
Acidic	Use Surface Insensitive Instant Adhesive	Leather & Plated Metals	790
Porous	Use Accelerator & Instant Adhesive	Ceramic & Fabric	268 & QFS16*
Porous and Acidic	Use Surface Insensitive Instant Adhesive & Accelerator	Wood & Paper	2011 & CSA - NF*
Polyolefin	Use Polyolefin Primer POP & Instant Adhesive	Polypropylene, polyethylene	105 & POP*

* Descriptions of these products are found on page 15

Blooming or frosting is caused by the liquid material vaporizing and reacting with the atmospheric moisture. The material cures and falls as a white dusty marking on the surface. PermaBond's proprietary low odor formulations contain low vapor pressure monomers which result in a less volatile product. There is little to no odor during application and virtually no residue when cured. This leads to improved aesthetics and worker comfort.

<i>Non-blooming, Low Odor</i>		Viscosity cP	Max. Gap Fill		*Shear Strength		*Set Time secs	Temperature Range	
Grade	Description		in.	mm	psi	N/mm ²		°F (°C)	°F (°C)
940	Low odor & low bloom, wicking type	7	0.002	0.051	2,600	18	10	-65 (-54)	180 (82)
941	Low odor & low bloom, close fitting parts	30	0.003	0.076	2,600	18	10	-65 (-54)	180 (82)
943	Low odor & non-blooming, general purpose	100	0.006	0.152	2,600	18	10	-65 (-54)	180 (82)
947	Low odor & low bloom, gap fill	1,200	0.010	0.254	2,600	18	25	-65 (-54)	180 (82)

* Grit blasted steel



Instant Adhesives

The 800 series offers the highest temperature resistance available in ambient cure conditions. PermaBond 919, 920 & 922 are formulated to offer increased temperature adhesive resistance with the use of a secondary heat cure process.

High Temperature Resistant		Viscosity cP	Max. Gap Fill		*Shear Strength		*Set Time secs	Temperature Range	
Grade	Description		in.	mm	psi	N/mm ²		°F (°C)	°F (°C)
801	Resists to 130°C, wicking type	35	0.003	0.076	3,000	21	10	-65 (-54)	270 (130)
802	Resists to 160°C	100	0.006	0.152	3,000	21	10	-65 (-54)	320 (160)
820	Resists to 200°C	100	0.006	0.152	3,000	21	10	-65 (-54)	390 (200)
919	Resists to 250°C, wicking type	4	0.002	0.051	3,000	21	10	-65 (-54)	482** (250**)
920	Resists to 250°C	80	0.006	0.152	3,000	21	10	-65 (-54)	482** (250**)
922	Resists to 250°C max. gap fill	1,600	0.017	0.432	3,000	21	10	-65 (-54)	482** (250**)

* Grit blasted steel
** With Secondary Heat Cure

Process to Maximize Temperature Resistance

In order to withstand high temperature environments, PermaBond 919, 920, & 922 were designed with a secondary curing mechanism that is activated at temperatures higher than 150°C (302°F). The procedure to activate this mechanism is:

- 1) Parts are bonded and clamped at room temperature for four hours.
- 2) The clamped parts are then heated at 150°C (302°F) for two hours*.
- 3) After the two hours, the bond will be thermally resistant up to 250°C (482°F)*.

* Without the secondary heat cure activation of the high temperature resistance properties these products will only resist temperatures up to 180°F (82°C)

TIP: Use only enough adhesive to cover the bond area. Excess adhesive will not increase bond strength and can reduce cure speed.

Primers, Accelerators & Solvents		
Grade	Type	Description
POP	Polyolefin primer	POP (Polyolefin Primer) improves the adhesion of cyanoacrylate adhesives to PP, PE, PTFE, other low surface energy plastics and silicones.
QFS10, QFS16	Cyanoacrylate accelerator	QFS10, QFS16 and CSA NF increase the speed of cure of cyanoacrylates and cure any exposed cyanoacrylate adhesive very quickly, thus reducing blooming and allowing products to cure through larger gaps.
CSA-NF	Non-flammable cyanoacrylate accelerator	
CA Solvent	Adhesive remover	PermaBond CA solvent dissolves cured cyanoacrylate adhesive.

UV Light Curable Adhesives



Flexible and non-yellowing, Permabond UV Light Curable Adhesives are single part, cure on demand and solvent-free adhesives. With temperature ranges of -65 to 250°F (-54 to 120°C) they are suitable for a wide range of applications.



UV curable adhesives cure when UV light activates the photo initiators. Many products also have visible light cure capabilities. Except for dual cure formulas, the curing process will cease when the light is removed.

Permabond UV7141 has a secondary anaerobic cure mechanism. UV light can be used to cure the exposed area, and the adhesive between the two pieces of metal will continue curing anaerobically. This product also has a slightly higher temperature resistance (-65°F to 300°F (-54°C to 150°C)).

Cure speed is affected by the wavelength and intensity of light at the bond site. Distance, attenuation, and light absorption by the substrate and through the gap of the adhesive all play a role in cure rate. Permabond adhesives have been designed to cure quickly with low intensity lamps.

Applications include:

- Bonding glass furniture
- Glass to metal structural bonding
- Acrylic display racks
- Electronics
- Lenses
- Solar panels
- Trophies and glass ornaments

UV Light Curable Adhesives

Grade	Description	Cure Type	Appearance (cured)	Visc. cP	Tensile Strength		Shear Strength		Shore D Hardness	Elongation
					psi	N/mm ²	psi	N/mm ²		
UV610	High strength, glass to metal	UV	Cloudy	900	2,500	17	1,900 - 2,300 ¹	13 - 16 ¹	70	95%
UV620	General purpose, optically clear, glass bonder	UV	Clear	2,500	2,300	16	1,300 - 1,500 ¹	9 - 10 ¹	62	75%
UV625	Large gaps, vertical application, glass bonder	UV	Clear	Gel	2,400	16.5	1,400 - 1,600 ¹	10 - 11 ¹	65	40%
UV670	Metal to glass, flexible	UV	Clear	2,500	1,700	12	1,100 - 1,300 ¹	8 - 9 ¹	58	85%
UV7141	Ceramic coated glass, glass to metal	UV-Anaerobic	Clear	1,500	3,000	20	2,000 - 2,500 ¹	14 - 17 ¹	N/A	N/A
UV630	Low viscosity, high strength, plastic bonder	UV-Visible	Clear	250	2,000	14	Substrate failure ²		60	110%
UV640	Medium viscosity, plastic bonder	UV-Visible	Clear	3,500	1,900	13	Substrate failure ²		60	110%
UV645	High viscosity, plastic bonder	UV-Visible	Clear	10,000	2,000	14	Substrate failure ²		65	110%
UV649	Thixotropic gel, plastic bonder	UV-Visible	Clear	Gel	2,200	15	Substrate failure ²		65	110%

¹ Steel to glass ² Polycarbonate to polycarbonate. The polycarbonate failed but the bond remained intact.

Epoxy Adhesives

Single-part epoxies are ideal for use in heavy wear-and-tear applications such as bonding tungsten carbide tools & machinery. They are often used to replace welding and brazing and can significantly reduce assembly production costs. Their excellent resistance to impact and temperatures from -40°F up to 355°F (-40°C to 180°C) make them a popular structural bonding choice.

- High peel strength increases joint design versatility
- Excellent chemical and environmental durability
- Significantly reduces assembly production costs
- Will bond most materials
- A good alternative to welding or brazing
- Low temperature curing grade for bonding heat vulnerable parts

<i>Epoxies - One Component</i>			Color	Viscosity, cP	Max. Gap Fill		Shear Strength*		Peel Strength*	
Grade	Description	in.			mm	psi	N/mm ²	PIW	N/25mm ²	
ES550	High strength, no sag	Grey	1,500,000	0.12	3.00	4,000 - 6,000	27 - 41	20 - 30	89 - 135	
ES558	High strength, free flowing	Grey	200,000	0.02	0.51	4,000 - 6,000	27 - 41	20 - 30	89 - 135	
ES562	High strength, free flowing	White	20,000	0.01	0.25	3,000 - 5,000	20 - 35	8 - 14	35 - 62	
ES569	High strength, no sag	Black	375,000	0.20	5.00	4,000 - 6,000	27 - 41	10 - 20	45 - 89	
ES578	Thermally conductive, electrically insulative	Black	700,000	0.20	5.00	4,000 - 6,000	27 - 41	10 - 20	45 - 89	

* Grit blasted steel

Two part epoxies cure at room temperature. Heat is not required but can be used to accelerate cure. Easy dispensing with a static mixing nozzle eliminates measuring and hand mixing. Permabond's ET5401 is a 2:1 mix ratio and resists temperatures from -40°F up to 285°F (-40°C to 140°C). All others are 1:1 and resist temperatures from -40°F to 175°F (-40°C to 80°C).

- High peel strength increases joint design versatility
- Easily dispensed through static mixers
- Excellent chemical and environmental durability
- No curing equipment required

<i>Epoxies - Two Component</i>			Viscosity cP, Mixed	Max. Gap Fill		Shear Strength*		Handling Strength mins.	Peel Strength*	
Grade	Description	Color		in.	mm	psi	N/mm ²		PIW	N/25mm ²
ET500	Fast, non-yellowing	Clear	12,000	0.08	2.00	1,750 - 2,000	12-14	4 - 6	10 - 13	45 - 60
ET505	Tough, multi purpose	Amber	20,000	0.08	2.00	2,600 - 3,000	18 - 21	180	13 - 18	60 - 80
ET510	Flexible, resists peel & impact	Amber	25,000	0.08	2.00	1,200 - 1,750	8 - 12	15 - 25	16 - 20	70 - 90
ET514	Toughened, high strength	Gray	65,000	0.20	5.00	2,600 - 2,900	18 - 20	60 - 90	13 - 18	60 - 80
ET515	Clear & flexible	Lt. Amber	20,000	0.08	2.00	1,200 - 1,750	8 - 12	15 - 25	13 - 18	60 - 80
ET536	Toughened, thixotropic	Gray	200,000	0.20	5.00	2,100 - 3,500	15 - 24	60 - 90	13 - 18	60 - 80
ET538	Bonds many plastics	Gray	300,000	0.20	5.00	2,600 - 2,900	18 - 20	180 - 240	13 - 18	60 - 80
ET5401	Thixotropic, high temp.	Gray	Thick Paste	0.20	5.00	1,200 - 1,750	8 - 12	30 - 60	3 - 5	20 - 25
						4,400 - 4,800†	30 - 33†	N/A	33 - 67†	150 - 300†

† ET5401 produces very strong bonds and high peel strength when cured at 80°C for 60 minutes. All other values above result from products cured for 24 hours at room temperature.

* Grit blasted steel

Structural Acrylic Adhesives

Permabond no-mix, surface activated structural acrylics are solvent free and greatly increase design possibilities due to the formation of strong bonds to a wide variety of substrates including metals, glass, magnets and composites

<i>Acrylic - No-Mix Surface Activated</i>				Fixture Time	Shear Strength*		Peel Strength*		Temperature Range		Gap Fill
Grade	Description	Color	Visc. cP		psi	N/mm ²	PIW	N/25mm ²	°F (°C)	°F (°C)	in (mm)
● TA430 & Initiator 41	Fast cure on close fitting parts	Amber	30,000	50 - 90 secs	2,200 - 3,600	15 - 25	10 - 14	45 - 65	-65 (-54)	250 (120)	0.02 (0.51)
● TA435 & Initiator 41	Very high strength, high impact	Amber	90,000	50 - 90 secs	2,200 - 3,600	15 - 25	18 - 22	85 - 100	-65 (-54)	250 (120)	0.02 (0.51)
● TA436 & Initiator 43	Very high strength, high impact & temp.	Amber	17,000	1 - 3 mins	2,200 - 3,600	15 - 25	10 - 14	45 - 65	-65 (-54)	300 (150)	0.02 (0.51)
● TA437	One component, metal bond	Orange	120,000	3 - 5 mins	2,000 - 3,000	14 - 20	18 - 22	85 - 100	-65 (-54)	390 (200)	0.02 (0.51)
● TA437 & Initiator 41	High strength, high temp.	Orange	120,000	30 - 45 secs	2,000 - 3,000	14 - 20	18 - 22	85 - 100	-65 (-54)	390 (200)	0.02 (0.51)
● TA439 & Initiator 41	Acid free & non-corrosive	Clear	1,000	10 - 20 secs	1,500 - 1,700	10 - 12	10 - 14	45 - 65	-65 (-54)	250 (120)	0.005 (0.12)
● TA459 & Initiator 43	High strength, acid free & non-corrosive	Blue	20,000	15 - 30 secs	2,900 - 3,600	20 - 25	N/A	N/A	-65 (-54)	300 (150)	0.02 (0.51)
TA4246 & Initiator 46	Surface activated MMA Highest strength	Amber	30,000	2 - 4 mins	4,800 - 5,000	33 - 35	33 - 40	150 - 180	-40 (-40)	120 (250)	0.02 (0.51)

Permabond TA440 is not dispensed through a static mixer but is designed to mix itself upon assembly. Simply dispense a bead of Part A, then dispense a bead of Part B on top of it. As the components are assembled, adequate mixing occurs to initiate cure. TA440 forms very strong durable bonds to metals and ferrites and resists temperatures from -65°F to 250°F (-54°C to 120°C).

Permabond TA4810 and TA4820 are methyl methacrylate adhesives. Both form high strength, durable bonds to many plastics, metals and unprimed metals. TA4810 sets up quickly and TA4820 allows more working time for complex assemblies. Both resist temperatures from -40°F to 250°F (-40°C to 120°C).

<i>Acrylic - Two Component</i>				Fixture Time	Shear Strength*		Peel Strength*		Gap Fill
Grade	Description	Color	Visc., cP		psi	N/mm ²	PIW	N/25mm ²	in (mm)
● TA440 A+B	Bead on bead for metal, glass, wood & rigid plastic	Amber/Green	10,000	< 30 secs	2,200 - 3,600	15 - 25	10 - 14	45 - 65	0.02 (0.5)
TA4810	2-part 1:1 toughened methacrylate adhesive; thixotropic; non-sag	Off-White/Amber	95,000	10 - 15 mins	3,500 - 4,500	24 - 31	14 - 22	65 - 100	0.08 (2.0)
TA4820	2-part 1:1 toughened methacrylate adhesive; thixotropic; non-sag	Off-White/Amber	95,000	30 - 35 mins	3,500 - 4,500	24 - 31	14 - 22	65 - 100	0.08 (2.0)

*Grit Blasted Steel

● Non Flammable

Accelerator, Primers, Activators & Solvents

CYANOACRYLATE - ACCELERATORS

Permabond CSA-NF, QFS10 and QFS16 are accelerators for use with Permabond cyanoacrylates. They are used to speed the cure rate, particularly on porous or acidic surfaces. These products also reduce blooming, cure adhesive that is outside of a joint and allow products to cure through larger gaps.

CYANOACRYLATE - PRIMER FOR POLYOLEFIN

Permabond (POP) is designed to increase adhesion when bonding surfaces such as polypropylene, polyethylene, silicone and PTFE with cyanoacrylate adhesives.



ANAEROBIC ADHESIVE - ACTIVATOR

Permabond ASC10 is a surface activator for anaerobic adhesives, suitable for use on non-metallic surfaces or on less active metals (see chart on page 5) to accelerate cure speed and allow products to cure through larger gaps.

ACRYLIC ADHESIVE - INITIATORS

Permabond Initiators are adhesive specific; consult the TDS for the appropriate initiator for each adhesive.

CYANOACRYLATE - SOLVENT

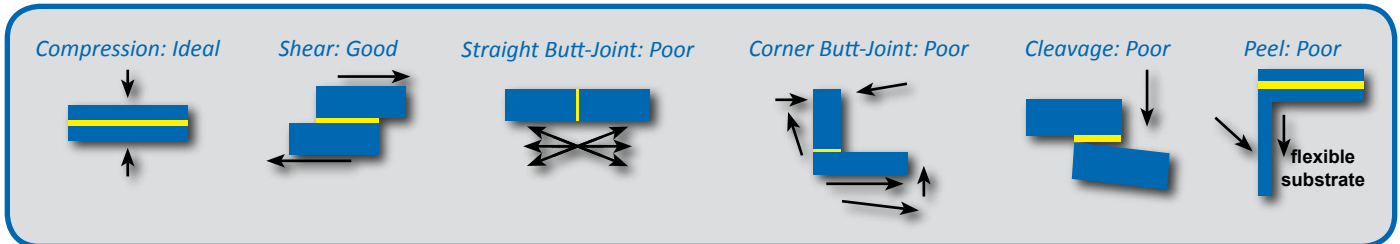
Permabond CA Solvent is extremely effective for dissolving cyanoacrylate bonds or removing cured excess adhesive.

Design Considerations

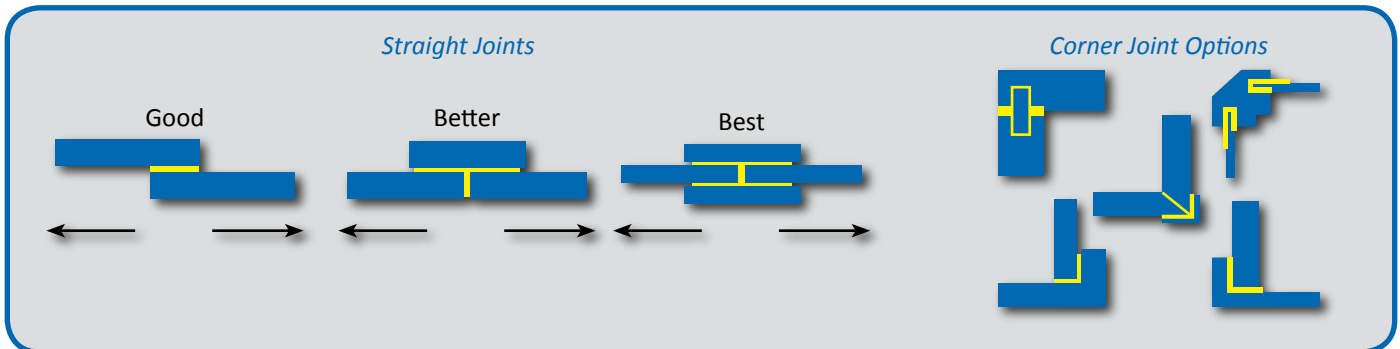
Designing components and assembly processes with adhesive use in mind improves quality and efficiency. In addition to adhesion, consider joint design, surface preparation, gap fill & viscosity, adhesive usage, and service conditions.

Joint Designs

Typical Joints



Suggested Improvements



TIP: Contact Permabond's Technical Support Department for joint design assistance.

Surface Preparation

Most materials can be bonded without surface pre-treatment unless surfaces are grossly contaminated. To achieve maximum performance and repeatable results, it is advisable to ensure the bondable surface is clean and consistent. Increasing the surface energy can optimize the bond strength. Various surface treatments can be used to increase the surface energy.

Surface Treatment

Low Surface Energy



Poor Wetting

- Solvent wiping
- Mechanical abrasion
- Chemical pretreatment
- Flame
- Chromic acid
- Iodine
- Corona or Plasma treatments
- Primers

High Surface Energy



Good Wetting

Substance	Viscosity mPa.s = cP	Substance	Viscosity mPa.s = cP
Water	1	Maple syrup	5,000
Milk	3	Honey	10,000
SAE 10 Motor oil	85-140	Chocolate syrup	25,000
SAE 20 Motor oil	140-420	Ketchup	50,000
SAE 30 Motor oil	420-650	Mustard	70,000
SAE 40 Motor oil	650-900	Sour cream	100,000
Castor oil	1,000	Peanut butter	250,000

Gap Fill and Adhesive Viscosity

Adhesive viscosity and gap fill capability are closely related - generally, for a given chemistry, the higher the adhesive viscosity, the larger the gap filling capability. It is important to note the maximum gap fill for each product. Exceeding the maximum gap fill can weaken bond strength. To help “get a feel” for viscosity measurements, the list to the left shows everyday substances and their approximate viscosity.

Adhesive Usage Estimates

The number of free flow drops per container is listed to the right. All of the data was determined using an 18 gauge needle to create an 1/8” (3.17mm) drop.

Actual Size ●

Container Size	Number of Drops	Container Size	Number of Drops
3 g	258	10 ml	150
20 g	1,720	50 ml	600
28 g (1 oz)	2,400	75 ml	1,125
30 g	2,580	250 ml	3,750
300 g	25,800	300 ml	4,500
454 g (1 lb)	39,044	500 ml	7,500
500 g	43,000	750 ml	11,250
2 Kg	172,000	1 Liter	15,000

Service Conditions

Chemical exposure can affect adhesives. It is important to consider not only the type of chemical the adhesive will be exposed to, but the concentration and the temperature of that chemical, the loading of the joint and whether the joint design leaves the adhesive vulnerable to attack.

The temperature range the joint will be exposed to is an important factor in deciding which adhesive to use. In general, adhesive strength reduces as temperature increases. Provided adhesives are kept within their recommended temperature range, full strength should be regained upon returning to room temperature. Products can withstand higher temperatures for brief periods providing the joint is not unduly stressed.

Permabond products conform to many company and industry specifications. Some of the most common are listed here.

Aerospace



Defense



Electronics



Military Specifications & Standards

MIL-S-22473E¹ • ASTM D5363²

Permabond Grade	Grade	ASTM D5363 Assigned #	Group	Class	Grade
HH120	AVV	AN 0124	01	2	4
HL126	AA	AN 0111	01	1	1
MM115	CVV	AN 0143	01	4	3
LM012	HVV	AN 0163	01	6	3
ASC10	N & T	N/A	N/A	N/A	N & T

MIL-A-46050C¹

Permabond Grade	Type/Class
101	Type II, Class 1
102	Type II, Class 2
105	Type II, Class 1
108	Type II, Class 3
170	Type I, Class 3
268	Type II, Class 3
790	Type II, Class 1
791	Type II, Class 1
792	Type II, Class 2
795	Type II, Class 3
798	Type II, Class 3
799	Type II, Class 4
910	Type I, Class 2
910FS	Type I, Class 1
919	Type V, Class 1
920	Type V, Class 2
922	Type V, Class 3
QFS16	All Types

Transportation



MIL-S-46163A¹ • ASTM D5363²

Permabond Grade	Type/Grade	ASTM D5363 Assigned #	Group	Class	Grade
HH120	I / L	AN 0211	02	1	1
HL126	III / R	AN 0261	02	6	1
HM118	II / O	AN 0331	03	3	1
HM128	I / K	AN 0221	02	2	1
LM113	II / M	AN 0311	03	1	1
MM115	II / N	AN 0321	03	2	1
ASC10	F	N/A	N/A	N/A	N & T

Automotive



CID A-A-3097

Permabond Grade	Type/Class
101	Type II, Class 1
108	Type II, Class 3
200	Type II, Class 3
791	Type II, Class 1
792	Type II, Class 2
795	Type II, Class 3
910	Type I, Class 2
910FS	Type I, Class 1
QFS16	All Types

MIL-R-46082B¹ • ASTM D5363²

Permabond Grade	Type	ASTM D5363 Assigned #	Group	Class	Grade
HL138	I	AN 0411	04	1	1
HM160	II	AN 0412	04	1	2
HM161	III	AN 0421	04	2	1

Electric Motor



¹MIL-SPECS are for existing designs ONLY
²ASTM D5363 is for NEW designs

Please contact Permabond if you don't see the information you require.



Furniture



Medical Device



Lighting

Medical - Biocompatibility

USP CLASS VI

Permabond Grade	USP CLASS VI
4C10	PASS
4C20	PASS
4C30	PASS
4C40	PASS

CYTOTOXICITY

Permabond Grade	CYTOTOXICITY
4C10	PASS
4C20	PASS
4C30	PASS
4C40	PASS
4UV80	PASS
1001	PASS
820	PASS

Oxygen Gas

BAM Certified

Permabond Grade	BAM Certification
MH052	Approved for use with gaseous oxygen up to 10 bar (145 psi) and 60°C (140°F).



Fire Protection

Fire Protection

Permabond Grade
LH056

FBC™ System Compatible indicates that this product has been tested, and is monitored on an ongoing basis, to assure its chemical compatibility with FlowGuard Gold®, BlazeMaster® and Corzan® pipe and fittings. FBC, FlowGuard Gold, BlazeMaster and Corzan are licensed trademarks of The Lubrizol Corporation.



Wind Energy

Underwriters Laboratory

UL Listed

Permabond Grade
LH050
LH150

Potable Water

NSF / ANSI 61 Certified

NSF's Certification Program is accredited by the American National Standards Institute

Permabond Grade
HH040 Pure
LH050 Pure
MM115 Pure



Utilities



Permabond Adhesives and Sealants are sold worldwide through authorized distributors. Contact us for a distributor in your area.

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info.americas@permabond.com

Europe: +44•1962•711661

Asia: +86•21•57734913

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